

Practitioner's Docket No.: 815\_001

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re the application of: Masahiko NAMERIKAWA, Kazuyoshi SHIBATA and Masaki IWAMOTO

Ser. No.: 09/918,274

Art Unit: 2834

Filed: July 30, 2001

Examiner: Not Assigned

Confirmation No.: 2785

For: PIEZOELECTRIC/ELECTROSTRICTIVE ELEMENT AND  
PIEZOELECTRIC/ELECTROSTRICTIVE DEVICE AND PRODUCTION METHOD  
THEREOF

Box Missing Parts  
Assistant Commissioner for Patents  
Washington DC 20231

"EXPRESS MAIL" mailing label number EL 872580006 US.

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 addressed to the Box Missing Parts, Assistant Commissioner for Patents, Washington D.C. 20231 on December 28, 2001.

*Elizabeth A. VanAntwerp*  
Elizabeth A. VanAntwerp

PRELIMINARY AMENDMENT

Sir:

Prior to examination, Applicants wish to amend the subject application as follows:

In the Abstract:

Please replace the Abstract with the following rewritten abstract:

ABSTRACT

A piezoelectric/electrostrictive element including a substantially trapezoidal laminate having narrower and wider surfaces lying substantially in parallel to each other and first and second surfaces opposed to each other between the narrower and wider surfaces. The first and second surfaces are inclined at given angles to one of the narrower and wider surfaces. The laminate includes piezoelectric/electrostrictive layers and interposed internal electrodes, the internal electrodes being broken up into a first and a second group, each of the first group internal electrodes lying over one of the second group internal electrodes through one of the piezoelectric/electrostrictive layers. A first external electrode is formed on the first surface of the laminate and is coupled to the first group internal electrodes. A second external electrode is formed on the second surface of the laminate and is coupled to the second group internal electrodes.

Prior to examination, Applicants respectfully request entry of this Amendment in which the abstract has been amended to correct minor informalities.

If the Examiner believes that contact with applicants' attorney would be advantageous toward the disposition of this case, he is herein requested to call applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Date \_\_\_\_\_

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Abstract:

The Abstract has been amended as follows:

ABSTRACT

The ~~Δ~~ piezoelectric/electrostrictive element ~~includes~~including a substantially trapezoidal laminate having narrower and wider surfaces lying substantially in parallel to each other and first and second surfaces opposed to each other between the narrower and wider surfaces; ~~the~~ The first and second surfaces ~~being~~are inclined at given angles to one of the narrower and wider surfaces; ~~said~~ The laminate ~~being made up of a plurality of~~includes piezoelectric/electrostrictive layers and ~~a plurality of~~interposed internal electrodes ~~each of which is disposed between adjacent two of the~~ piezoelectric/electrostrictive layers, the internal electrodes being broken up into a first and a second group, each of the first group internal electrodes lying over one of the second group internal electrodes through one of the piezoelectric/electrostrictive layers; ~~a~~ A first external electrode is formed on the first surface of ~~said the~~ laminate, ~~said first external electrodes being~~ and is coupled to the first group internal electrodes; ~~and a~~ A second external electrode is formed on the second surface of ~~said the~~ laminate, ~~said second external electrodes being~~ and is coupled to the second group internal electrodes. Since it is of a substantially trapezoidal shape which decreases in width from one of the bottom surfaces to the other bottom surface, the angle which the slant surfaces of both sides make with the other bottom surface is obtuse, thus resulting in an increase in strength of a ridge portion (a corner) defined by the other bottom surface and the slant surfaces. When the other bottom surface of the piezoelectric/electrostrictive element is secured on a movable plate (diaphragm) by adhesive, a recess-shaped ( $\nabla$ -groove shaped) gap defined by the movable plate and the slant surfaces of both the sides of the piezoelectric/electrostrictive element can be filled with the adhesive, thereby resulting in a further increase in force (bonding strength) which secures the piezoelectric/electrostrictive element to the movable plate. The existence of the adhesive in the recess-shaped gap offers the effect of avoiding removal of the piezoelectric/electrostrictive element from the movable plate even if the

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stress arising from a difference in thermal expansion between the piezoelectric/electrostrictive element and the movable plate is produced:

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